ENVIRONMENTAL ASSESSMENT

MAINTENANCE DREDGING

CONNECTICUT RIVER
SAYBROOK AND CALVES ISLAND

SAYBROOK, CONNECTICUT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.
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CONCLUSIONS

Based on my review of the information within this Environmental Assessment and in consideration of the general public need, I believe the project as described should proceed according to schedule. In my evaluation, the Assessment prepared in accordance with the National Environmental Policy Act of 1969 is an accurate document revealing that proper coordination with appropriate regulatory agencies has been conducted with subsequent minimization of environmental impacts insured based on the scheduling of the actual work and disposal site selection. The Assessment therefore precludes the need for preparation of a formal Environmental Impact Statement.

15 april 1977
(Date)

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

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1. PROJECT DESCRIPTION

Old Saybrook is located in Middlesex County in south central Connecticut at the mouth of the Connecticut River. It is bounded on the west by the town of Westbrook, on the north by Essex, and on the east by the Connecticut River. Old Lyme lies to the east across the river, and the town is bordered by Long Island Sound to the south (Figure 1).

The project involves three areas in the Connecticut River at Old Saybrook: Saybrook Shoal, Saybrook Outer Bar, and Calves Island. Periodic dredging at these sites must be undertaken to maintain the authorized Federal Navigation Channel.

Maintenance dredging in the Connecticut River at the previously mentioned sites will entail the removal of approximately 75,000 cubic yards of predominantly silty sand with varying amounts of organics to be disposed of in the relocated Cornfield dumping area (see Fig. 2). The proposed action will restore the Federal Navigation project in that segment of the river to the authorized depth of 15 feet.

The method of dredging is uncertain at this time. Both the Government hopper-dredge method and contracted bucket or clamshell utilizing dump scows are being considered. This uncertainty arises as Congress has established a new policy whereby certain projects have been set aside for dredging contractors to bid against Government hopper-dredging. Accordingly, bids will be taken later this year (May 1977), at which time the method of dredging will be determined.

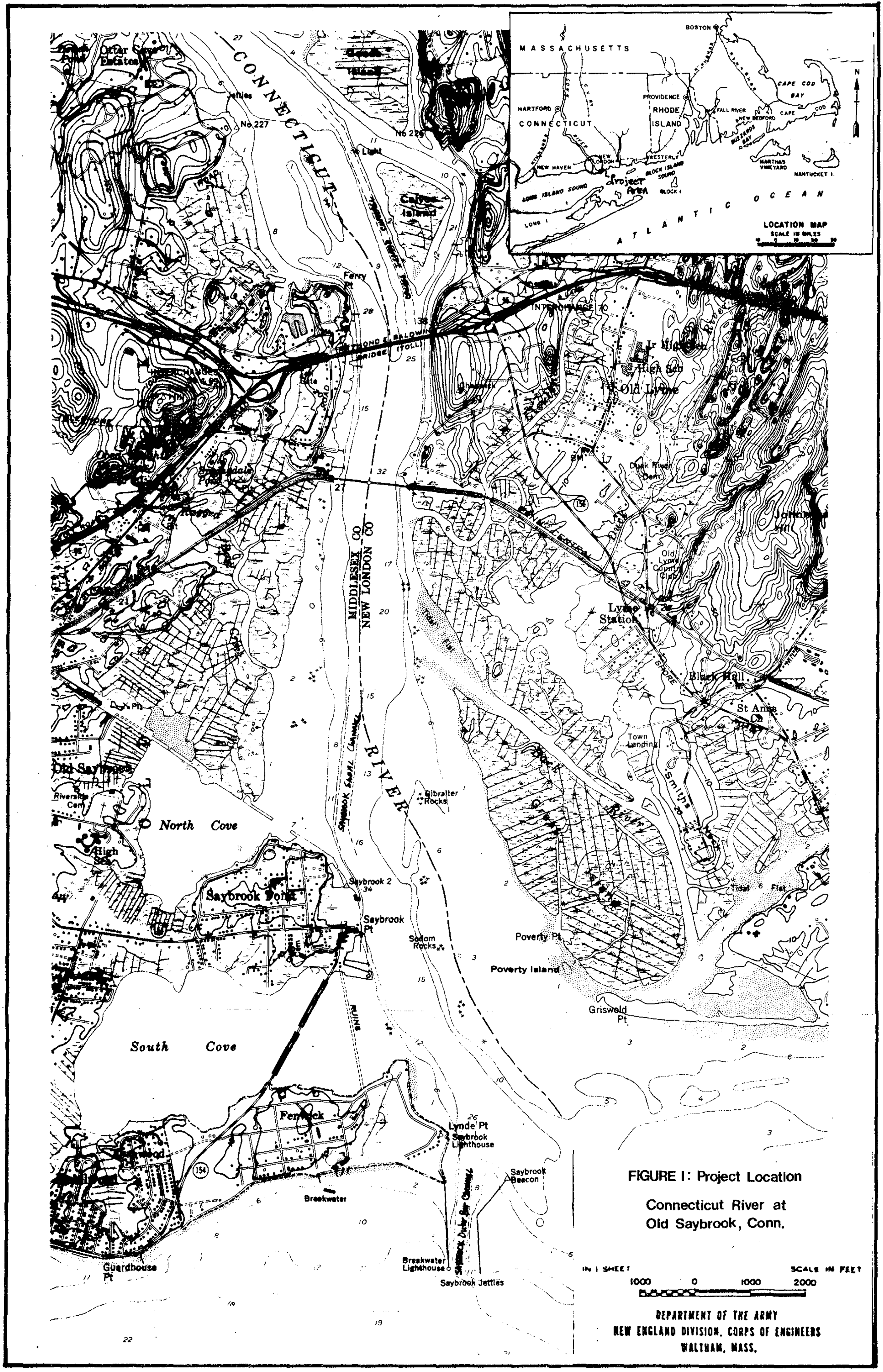

FIGURE I: Project Location

Connecticut River at Old Saybrook, Conn.

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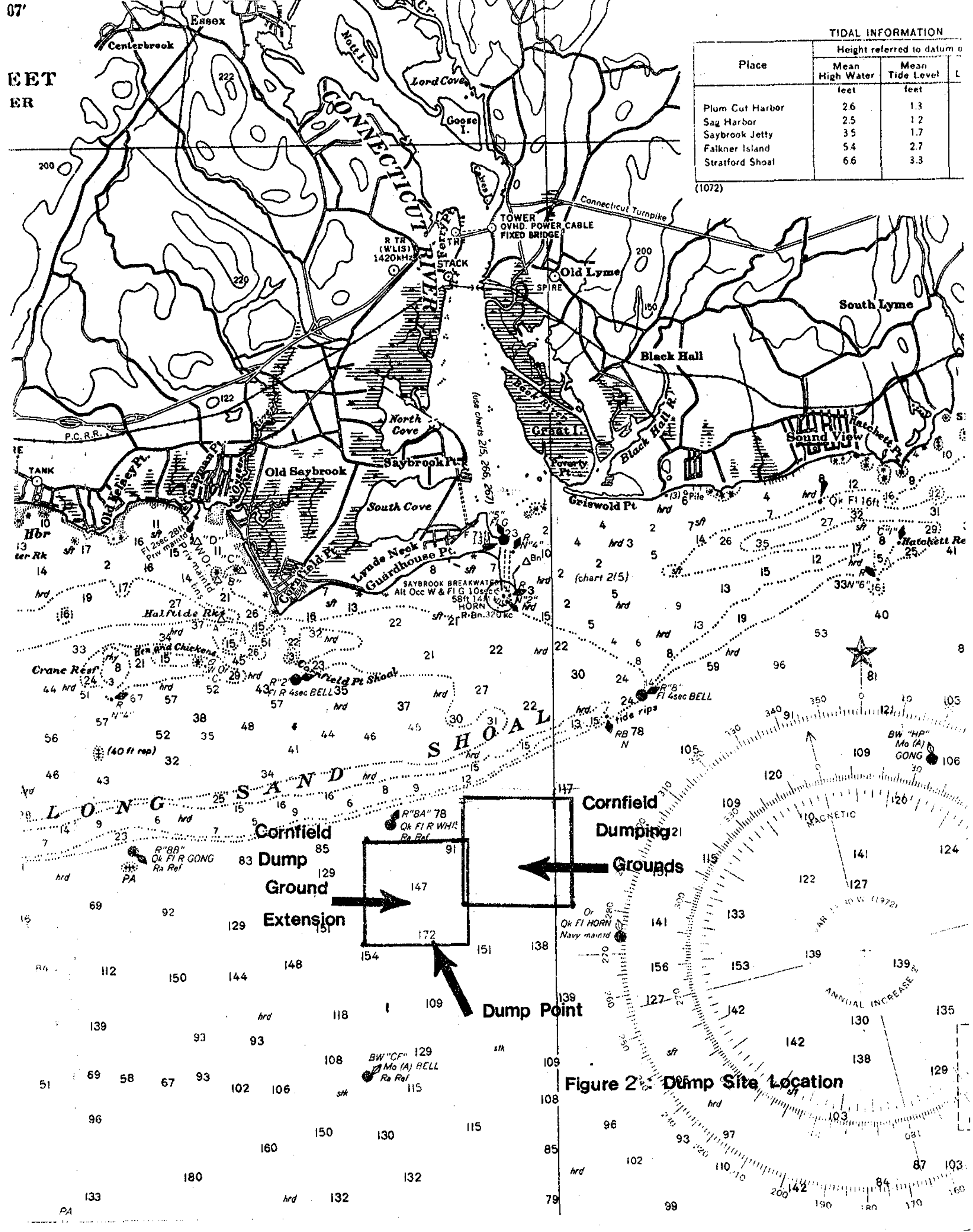
a. Dump Site. The charted Cornfield Shoal Dredging Ground is proposed as the open water dump site (Figure 2). The proximity of this site to the proposed dredging and the fact that it has been used previously for disposal of material from North Cove during maintenance dredging resulted in its being given consideration in the proposed project. This area is one nautical mile square (with sides running true north-south and east-west) the center of which is 5,930 yards from Saybrook Breakwater Light on a true bearing of 198°15'. Point dumping will be employed in disposal operations with the project located at 41° 12.6'N, 72° 21.6'W, or 6,650 yards from Saybrook Breakwater Light on a true bearing of 194°. The point is over a natural depression that is approximately 170 feet deep.

b. Background. There have been many reports dating back to 1837 on the Connecticut River relative to improvement for commercial navigation (Figure 4). In general, these reports have covered improvements at particular localities or bars in the river such as anchorages and access channels, and improvements for commercial navigation to Hartford, including channels, dikes, training walls and revetments. The existing project consists of two riprap stone jetties at the mouth of the river, the tops to be 5 feet above mean high water and 6 feet wide, being 2,300 and 2,750 feet long, east and west respectively (River and Harbor Act as of 10 June 1872); a training dike about 3,700 feet long at Hartford (River and Harbor Act of 3 March 1881); a channel 8 feet deep, 75 feet wide and 1.5 miles long in Eight Mile River, from the Connecticut River to Hamburg, with an 8 foot turning basin 150 feet wide and 300 feet wide



Place	Mean High Water (feet)	Mean Tide Level (feet)
Plum Gut Harbor	2.6	1.3
Sag Harbor	2.5	1.2
Saybrook Jetty	3.5	1.7
Falkner Island	5.4	2.7
Stratford Shoal	6.6	3.3

Figure 2 : Dump Site Location

from Long Island Sound to Lyme Railroad Bridge about 3.4 miles (River and Harbor Act of 27 February 1911), thence 15 feet deep and 150 feet wide to Hartford, about 48.6 miles (River and Harbor Act of 30 August 1935), resulting in a total distance of 52 miles; the construction of training walls, dikes, revetments and accessory works from the mouth to Hartford (River and Harbor Act of 2 March 1919); anchorages 11 feet deep about 12 acres, and 6 feet deep about 17 acres in North Cove, Old Saybrook, with an entrance channel 11 feet deep and 100 feet wide (River and Harbor Act of 2 March 1945); Essex Cove Channel, 10 feet deep, 100 feet wide and about 4,400 feet long adjacent to the Essex waterfront, with a 10-foot anchorage about 15 acres bounded by 10 and 15-foot channels, and an anchorage of about 19 acres 8 feet deep bounded by 10 and 15-foot channels (River and Harbor Act of 14 July 1960, Section 107); and a 6-foot channel into Wethersfield Cove 60 feet wide leading to a 6-foot anchorage of about 30 acres (River and Harbor Act of 14 July 1960, Section 107). The foregoing depths refer to mean low water. Mean tidal range is 3.5 feet at mouth and one foot at Hartford.

Various portions of the Connecticut River Navigation project have been dredged intermittently since the 1930's. Disposal has been made primarily in upland areas except for dredging close to the mouth at which time material was disposed of in Long Island Sound. Following is a listing of maintenance dredging projects since 1964

Dates	Features Dredged	Disposal
Nov 1976-Jan 1977 (Approx. 150,000 cy)	North Cove, Brockway Bar, Essex Shoal	Open Water
July 1976-Dec 1976 (Approx. 200,000 cy)	Potash, Haddam Island, Higganum Creek Sears, Upper, Cromwell, Pistol Point, Glastonbury Two Piers, and Glastonbury Upper	Land Sites
March 1976-May 1976 (41,000 cy)	Essex Shoal and Essex Recreational Channel	Land Site
Sept 1973 (84,800 cy)	Saybrook Outer, Saybrook Shoal	Open Water
Aug 1972-Oct 1973 (140,300 cy)	Sears, Sears Upper, Cobalt, Paper Rock, Mouse Island, Dividend, Press Barn, Claybanks and Claybanks Upper	Land Sites
Aug 1970-Jan 1971 (288,200 cy)	Calves Island, Potash, Higganum Creek, Haddam Island, Pistol Point, Glastonbury Two Piers, Glastonbury Upper, Naubuc, Saybrook Outer, Saybrook Shoal and Brockway	Land Sites
July-Sept 1968 (147,200 cy)	Saybrook Outer, Brockway, Potash Eddy Rock, Glastonbury, Upper, and Glastonbury Two Piers	Land Sites
Aug-Oct 1964 (164,300 cy)	Cobalt, Dividend, Essex, Naubuc, Sears Upper, Paper Rock, Pistol Point and Rock Landing	Land Sites

2. ENVIRONMENTAL SETTING WITHOUT THE PROJECT

a. Connecticut River. The Connecticut River, the largest River in New England, begins in the northern portion of New Hampshire and flows south to Long Island Sound, a distance of approximately 409 miles. At Old Saybrook, Connecticut, the river enters the sound and is the most conspicuous indentation of the shoreline. Tidal effects reach upstream to Hartford, Connecticut, a distance of 52 miles.

The Connecticut River provides suitable habitat for aquatic wildlife, including various finfish species. In recent years cooperative efforts between State and Federal Agencies have included the restoration of anadromous fish in the river.

The Connecticut River from East Hampton to the river mouth (shellfish closure line) was classified as Class SC by the Connecticut Department of Environmental Protection (Conn. DEP) in 1973. Water quality conditions in 1976 are expected to be Class SB. Present conditions are considered suitable for fish, shellfish and wildlife habitat; for recreational boating and industrial cooling; and for good esthetic quality.

b. Climate and Tidal Regime. Long Island Sound provides important influences on the meteorology and climatology of the proposed site. The moderating effect of the Sound waters makes summers cooler and winters somewhat warmer than experienced a short distance inland. Precipitation is fairly evenly distributed throughout the year. Heaviest rainfall is associated with cyclonic storms of both tropical and extra-tropical origin. Winter precipitation often occurs as rain at the shoreline while occurring as freezing rain or snow inland. Intense rainfall during the summer months is often produced by severe cyclonic storms, especially hurricanes and occasionally by thunderstorms. During the last half of June 1973 and continuing through July 1973, New England experienced abnormally high amounts of rainfall, especially in northern New England. As a result, the summer runoff was also higher than normal creating some additional erosion upstream and sedimentation downstream.

c. Geologic and Topographic Setting. The Connecticut River Basin between Turners Falls, Massachusetts and Middletown, Connecticut lies in the Connecticut Lowland of the New England physiographic province. This is a region of subdued hills which extends on both sides of the broad, terraced river valley to the borders of the enclosing Upland. Bold ridges of resistant trap rock project above the eroded hills of the Lowland Section and constitute the major topographic feature of this region. The basin is maturely dissected with the river meandering in a wide, open valley with a well developed floodplain in the Hartford area. At Middletown the river turns from southerly flow to southeast, leaves the Lowland, and cuts through the southern portion of the New England Upland in a narrow valley to Long Island Sound. The topography of the entire basin has been modified by glaciation which scraped the tops from the bedrock hills and filled the valleys with glacial detritus. There was, however, apparently little actual diversion of drainage by the glacier in the Connecticut Basin. The major effect of the glacial fill in the valleys has been to raise the streams from their old beds, thereby permitting the development of present channels which have little or no relation to the underlying configuration of the old valley in the bedrock.

d. Existing Land and Water Uses. Bordering the Connecticut River between Long Island Sound and Hartford are 17 cities and towns having an estimated population of 500,000; however, the population that is served by the existing commercial navigation channel to Hartford is estimated at 1.3 million. The area bordering the river is a rich farming and industrial region, and the cities of Hartford and Middletown are large industrial centers manufacturing a wide variety of products.

There are seven yacht clubs and seven boat clubs located along the river between the mouth and Hartford; 12 boatyards and 34 marinas provide service for boats ranging from small skiffs to large yachts.

Waterborne commerce on the Connecticut River to Hartford has increased slightly during the period 1960-1975, from 2,556,308 to 2,562,245 tons. This commerce consisted primarily of petroleum and petroleum by-products shipped from New York and other nearby ports. In 1967-68 Middletown and Hartford became larger receiving centers for oil products.

Ferry service on the river below Hartford carried 406,295 passengers in 1975, with an additional 109,964 automobiles accompanying passengers.

During 1975 a total of 68,143 commercial vessel trips were reported having a maximum draft of 17 feet. Approximately 50% of total commerce is transported on vessels and barges having drafts greater than 12 feet. Although nearly one-third of the vessels used to deliver petroleum products are small coastwise tankers, which navigate on flood tide to pass over shoaled areas in the existing channel, these tankers are being phased out in favor of barges of 4,000 ton capacity drawing 14 feet. Barges are a more economical means of transporting oil to meet the needs of terminals scattered along the river because the towboats are able to leave the barges for loading and unloading thus eliminating the cost of in-port time incurred by the tankers.

e. Socio-economic Data. As with most communities bordering Long Island Sound, Old Saybrook has experienced steady growth in recent decades. The population was 2,499 in 1950, and 8,468 in 1970. Current population is over 9,000 (State of Connecticut, 1973). Old Saybrook is 42 miles south of Hartford, Connecticut; 110 miles east of New York City, and 115 miles southwest of Boston, Massachusetts. Other major metropolitan areas within 100 miles include Bridgeport and New Haven, Connecticut, Springfield and Worcester, Massachusetts and Providence, Rhode Island.

Old Saybrook is an important resort community. Approximately one-third of the dwellings are seasonal, and many are available for short term or summer rental. Access to the water and the beach and ocean environment make aquatic recreation an important feature. Yachting is a favorite activity (Old Saybrook Chamber of Commerce, 1973).

Industrial development of the shore areas has been kept to a minimum, although the town does welcome new sources of jobs and products. The area is serviced by rail, airplanes and highway. Retail service establishments have increased with population; however, the town is not highly commercialized. Industry is represented by approximately 40 establishments that cover a wide range of products and services, including boat building and repairs; commercial printing; furniture; electronic equipment; plastics and timing devices (Old Saybrook Chamber of Commerce, 1973).

f. Fishery Resources. The following data was extracted from the Millers River Diversion Environmental Impact Statement (see References). A total of forty species of finfish were collected in the lower Connecticut River from 1965 to 1970 (Tables 1 and 2). Among the top twenty, based on rank in total numbers, are three species of anadromous fish: the Alewife (*Alosa pseudoharengus*), American Shad (*Alosa sapidissima*), and the Rainbow Smelt (*Osmerus mordax*). Anadromous fish are characterized by an annual spawning run into fresh or brackish water, while spending most of their adult life in a marine environment. The timing of the spawning runs are temperature dependent. Legett (1969) observed that shad begin to enter the river at 40° to 43° F. This occurs in April or May each spring. The alewife spawns ordinarily in April at temperatures of about 55° to 60° F, while the Rainbow Smelt timing compares favorably to the shad (Big & Schr. 1953). As previously stated, these species depend on fresh water for completion of their life cycle and safeguards should be made not to disturb them.

g. Benthic Investigations. As far as is known no benthic studies have been or are being conducted in the Connecticut River at Saybrook Shoal, Outer Bar, or Calves Island.

h. Historical and Archeological Features. The proposed maintenance dredging of Saybrook Shoal, Outer Bar, and Calves Island will have no effect on potential cultural resources in the project area. This determination is substantiated by the project description which indicates that the proposed dredging will remain within previous dredge limits.

i. Rare and Endangered Species. No rare and endangered species are known to be within the project area. There are no impacts which will occur in this respect.

j. The Cornfield Dumping Grounds. In a benthos survey of the Cornfield Point Disposal Area (Pratt 1976), sediments in the deeper basins are described as silty, mixed with sand and pebbles. There is widespread occurrence of blue mussels (*Mytilus edulis*) attached

TABLE 1

Rank of fish species by number and weight collected in the lower Connecticut River from 1965 to 1970.

Scientific Name	Common Name	Rank in total Numbers	Rank in total Weight
Alosa aestivalis	Blueback herring	1	4
Alosa pseudoharengus	Alewife		
Morone americana	White perch	2	1
Notrophis hudsonius	Spottail shiner	3	7
Brevoortia tyrannus	Atlantic menhaden	4	17
Ictalurus nebulosus	Brown bullhead	5	2
Ictalurus catus	White catfish	6	5
Fundulus diaphanus	Banded killifish	7	13
Notemigonus crysoleucas	Golden shiner	8	10
Lepomis gibbosus	Pumpkinseed		
Lepomis macrochirus	Bluegill	9	11
Lepomis auritus	Redbreast sunfish		
Fundulus heteroclitus	Mummichog	10	14
**Alosa sapidissima*	American shad	11	19
Etheostoma nigrum	Johnny darter	12	15
Perca flavescens	Yellow perch	13	8
Anguilla rostrata	American eel	14	6
Menidia menidia	Atlantic silverside	15	22
Anchoa mitchilli	Bay anchovy	16	28
Osmerus mordax	Rainbow smelt	17	21
Catostomus commersonii	White sucker	18	9
Cyprinus carpio	Carp	19	3
Notropis cornutus	Common shiner	20	27
Esox americanus	Redfin pickerel	21	18
Esox lucius	Northern pike	22	12
Microgadus tomcod	Atlantic tomcod	23	25
Pomoxis nigromaculatus	Black crappie	24	24
Pomatomus saltatrix	Bluefish	25	26
Micropterus salmoides	Largemouth bass	26	20
Ictalurus punctatus	Channel catfish	27	32
Fundulus majalis	Striped killifish	28	29
Caranx hippos	Crevalle jack	29	30
Morone saxatilis	Striped bass	30	23
Esox niger	Chain pickerel	31	16
Synathus fuscus	Northern pipefish	32	31
Gasterosteus aculeatus	Threespine stickleback	33	33
Apeltes quadracus	Fourspine stickleback	34	34
Clupea harengus	Atlantic herring	35	35
Ambloplites rupestris	Rock bass	36	36
Cynoscion regalis	Weakfish	37	37

*Juveniles only

TABLE 2

Summary of resident and anadromous fish species by number, collected by bag seine and trawl in the lower Connecticut River from 1965 to 1970. Total weights represent 1965 to 1967 data only.

Species	Number Collected Adult	Number Collected 0-Year	Total	Total Weight (Grams)
B. tyrannus	214	10,907	11,121	1,855
A. sapidissima	40	1,131	1,171	1,500
A. pseudoharengus	322	5,207	5,529	29,808
A. aestivalis	394	2,986	3,380	14,187
Alosa spp.	3,895	63,961	67,856	71,958
C. harengus	0	1	1	0
O. mordax	129	132	261	1,450
A. mitchilli	16	316	332	100
E. americanus	42	16	58	1,685
E. lucius	32	14	46	4,807
C. commersonii	117	109	226	41,672
E. niger	4	0	4	2,110
C. carpio	160	5	165	144,855
N. crysoleucas	1,100	626	1,726	16,836
N. hudsonius	7,074	13,052	20,126	58,407
N. cornutus	59	7	66	125
M. tomcod	8	13	21	240
A. rostrata	728	6	734	65,975
I. catus	3,682	3,694	7,376	105,647
I. nebulosus	6,261	2,499	8,760	210,319
I. punctatus	3	5	8	0
F. heteroclitus	820	370	1,190	3,444
F. majalis	2	5	7	45
F. diaphanus	495	1,537	2,032	3,572
S. fuscus	4	0	4	10
M. menidia	78	560	638	1,157
A. quadracus	0	1	1	5
G. aculeatus	1	0	1	5
P. flavescens	715	140	855	41,730
E. nigrum	679	250	929	2,884
P. saltatrix	1	13	14	145
C. hippos	1	4	5	15
L. gibbosus	370	531	901	9,341
L. macrochirus	13	24	37	760
Lepomis spp.	48	394	442	3,847
A. rupestris	2	0	2	0
L. auritus	19	0	19	1,065
M. salmoides	7	5	12	1,415
P. nigromaculatus	14	0	14	720
M. americana	3,132	21,992	25,124	307,721
M. saxatalis	0	0	0	0
T. maculatus	0	0	0	0
S. atromaculatus	0	0	0	0
S. corporalis	0	0	0	0
C. regalis	0	0	0	0
M. dolomieui	0	0	0	0
Totals	30,681	130,513	161,194	1,151,417

to one another and to coarse sediment particles. A large number of species are found at these stations although the biomass is not high. In addition to the blue mussel other filterfeeding bivalves (Musculus, Astarte); predators of mussels (the gastropods Polinicus, Urosalpinx, and Anachis); and parasites of mussels (the crab Pinnotheres maculatus) are found.

The polychaetes recovered are almost all deposit feeders. These include deep burrowers and several species which live in tubes and pick up food from the surface with long tentacles (Polycirrus spp, Amphitrite arnata, Asabellides oculata).

Other species are typical of fouling assemblages on pilings and shells, living in crevices or attached to solid objects (Crepidula plana; Caprellid amphipods, the scale worms, Harmothoe and Pholoe; and sponges).

The general area in which the Cornfield Dumping grounds is located is assumed to be inhabited by nearly all of the approximately 100 finfish species known to inhabit Long Island Sound. Commercially important finfish in the area include shad, manhaden, alewife, scaup and flounder. The lobster yield and the intensity of fishing are not available.

3. RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS

Land areas adjacent to the proposed project area have already been dedicated to water related activities, such as recreational boating and waterborne commerce. Maintenance dredging is in keeping with these activities and will serve to preserve them.

The activities of recreational vessels and commercial vessels in the Connecticut River are of major significance. Maintaining the Connecticut River channel to authorized dimensions will help to insure that the regional economy based on waterborne commercial traffic is maintained, and this will help to eliminate delays and potential hazards being experienced by commercial navigation.

The Old Saybrook area is a valuable cultural and historical resource. Preservation of the general area for recreation, scenic, and cultural resources is recommended in recent reports (NERBC, 1973, 1974). The proposed project, in providing for the continuation of recreational potential of the area, is consistent with the broad objectives of such plans. Inasmuch as disposal will be in open water, the project does not relate to the use of land as disposal sites.

4. PROBABLE IMPACT OF PROPOSED ACTIONS ON THE ENVIRONMENT

The impacts of the project are varied. Impacts, irrespective of the method of dredging ultimately decided, will be similar. They will occur as a result of physical disruption of benthic communities and consequences associated with sediment introduction into the water. The latter necessitates a detailed analysis of dredged sediment to competently determine potential negative effects to water quality (see Section 4.c).

a. Impacts of Dredging. In the Connecticut River there will be disruption and removal of benthic communities as a result of dredging. The extent of these impacts will depend on the mobility, nutritional characteristics, diversity, and productivity of the biota in the area in which dredging and settling occurs (McCauley, et al, 1976).

However, disruption is not new to this area. A past history of maintenance dredging and current high commercial usage indicate that under normal conditions the environment is subject to frequent disturbances. It has been shown that commercial activity may simulate small scale maintenance dredging (Slotta et al 1973). For instance, it has been observed that large vessels dragging anchors over the bottom appear to produce the same decline in abundance at the spoil site as the suction heads introduced at the dredge site. Furthermore, input of suspended material during high runoff periods coupled with input from commercial traffic would result in highly turbid water. This suggests that species present are already tolerant to fluctuation in turbidity and disruption.

Therefore, the proposed maintenance dredging will pose no severe change to present environmental conditions In fact, maintenance of the Federal channel will prevent a potential adverse impact. As the process of sedimentation decreases the depth of the channel, commercial traffic will result in increasingly greater disturbances of the bottom due to prop wash.

The release of particulates, potentially toxic compounds, and nutrients can have both detrimental and beneficial effects of phytoplankton. Increased amounts of suspended matter will temporarily increase turbidity, and thus decrease light penetration. Phytoplankton depend physiologically on light and suspended nutrients to manufacture organic compounds. Variations in light from normal levels can affect photosynthesis, productivity, diversity, density, and community structure of phytoplankton. Nutrient release, on the other hand, can cause temporary phytoplankton blooms which may eventually result in deterioration of water quality. However, this is not probable (Lee, et al, 1975, Chen, et al, 1976). In the event of a phytoplankton decrease, this situation should only be temporary. The small planktonic organisms have high reproductive capacities.

An increase in oxidizable materials (measured as the "Chemical Oxygen Demand") in the water may eventually cause a decrease in dissolved oxygen. Changes in the D.O. are not likely as dispersion will dilute organics to inconsequential amounts.

pH is an important aspect to all life and a large change from normal values may cause death or severe physiological stress. It is unlikely that this will result, as the natural buffering capacity of both the river and sea is sufficient to keep the pH within a safe range.

In the process of sediment deposition, heavy metals are concentrated. Many of these metals are highly toxic such as mercury and might be fatal in very minute quantities. Heavy metals in the sediment are usually not adequately concentrated to cause problems, however, magnification from successive concentration through trophic feeding levels causes them to become dangerous. A review of results from recent research efforts concerned with the release of heavy metals and potentially toxic compounds during dredging and disposal operations leads to the conclusion that the potential for such releases, and thus for subsequent environmental damage, is slight. Heavy metals released to the water are considered a relatively short-term event (Lee et al 1975; Chen et al 1976).

In summary, dissolved oxygen (D.O.) oxidizable materials, pH, and heavy metal content are some aspects of water quality which might be altered by dredging. However, since normal activity in the Connecticut River involves frequent sediment disruption it is expected that maintenance dredging will pose no severe impacts to river biota, except those in the direct path of the dredge.

b. Impacts of Dumping. Effects to water quality by discharged sediment will include increases in both quantitative and qualitative parameters as discussed in the previous section. In addition, as settling occurs, some burial of benthic organisms is expected. As previously described, increased turbidity will be the quantitative effect, while dissolved oxygen, oxidizable material, pH, and heavy metals are the main qualitative aspects. Because of the relatively small amounts of spoil to be dumped in relation to the large volume of potential solvent (Long Island Sound) effects will not be widespread.

Impacts of disposal will be confined to the immediate area of dumping. Furthermore, these effects will only be present for a short period of time. This time period will be directly proportional to settling and dispersion rates. Other than to sessile biota, adverse impacts to life will be minimal. Any motile animal present in the area at the time of discharge will escape into adjacent waters. While there will most certainly be some loss of benthos, this loss should not be considered permanent. In fact, if care is taken in choosing the disposal site on the basis of sediment match, at least physically, recolonization will be rapid. Attention to this concern will ensure that a community similar to that already established will reestablish after dumping operation has ceased, and reduce the possibility of a major long term alteration to the biota of the dump site. If this concern is not met, the newly deposited sediment may be slow to be recolonized as there may be insufficient recruitment populations in the immediate area of a type adaptable to the new substate.

c. Sediment Analysis of the Dredge Site. In March 1974, the Army Corps of Engineers conducted a sieve analysis and visible classification for two sites at Calves Island Bar (for sample location see Figure 3).

PE-1	Med-fine Sand (SP)
PE-2	Fine Sand (SP)

In April 1975 a more detailed analysis was conducted for seven locations at Saybrook Shoal and Outer Bar. Results of this analysis are contained in Table 3. The following is a list of the sample and its visual classification.

	DEPTH IN FEET	
	0.0-0.17	0.17-1.8
PE-1	Not Available	
PE-2	Grey Organic Silt (OH)	Black Organic Silt (OH) Leaves, Roots
GE-1 (Surface)	Black Sandy Organic Silt w/shell fragments	
PE-3	Black Organic Silt (OL) w/roots.	
PE-4	Grey Brown, Med. to Fine Sand (SP)	Black Organic Silt (OH)
PE-5	Grey Brown, Med. to Fine Sand (SP)	Grey Black Silty Med. Fine Sand
PE-6	Black Sandy Silt (MC), w/some Organics	Grey Med. to Fine Sand (SP)

The Environmental Protection Agency has established numerical guidelines for Mercury and Cadmium only. As shown in Table 3, both Mercury and Cadmium levels were exceeded; intermittently for Mercury, but consistently for Cadmium. Based on the bulk chemical analysis results of the sediment the dredge materials may be classified as "polluted". However, examination of test results from twenty-nine harbors and channel areas in Massachusetts revealed Cadium concentrations to exceed the .6 mg/kg critical limit to all projects sampled (Chase, 1977). In addition Cadium levels obtained in association with offshore marine sediments in Rhode Island Sound and Gulf of Mexico were also found to exceed EPA's current guidelines and there the degree of pollution then concerning this particular parameter is one of conjecture and probably deserves re-evaluation.

Table 4 shows a bulk sediment analysis comparison between Saybrook Shoal and Outer Bar, an industrialized area, Branford Harbor, Connecticut and two nonindustrial marine areas, Hampton Harbor and Cape Cod Canal. Data shows that core sediment in the Connecticut River are less polluted than those of Branford Harbor. This suggests that the Connecticut River, although probably more heavily used than Branford contains at least normal, if not lower than normal, levels for the parameters studied. Cape Cod Canal shows a marked decrease in all levels, reflecting a very unpolluted, nonindustrialized environment. Hampton Harbor, although not an industrial center, has slightly higher values than the Connecticut River for total Kjelhahl Nitrogen, Hexane soluble oil and grease, Chemical Oxygen Demand, Arsenic, and Chromium.

Elutriation tests of samples of sediments to be dredged are an alternative technique, to bulk analysis for determining the acceptability of dredged materials at a specified ocean disposal site. The procedure as described by the EPA guidelines (227.13 Fed. Register 11, Jan. 1977) is to mix one volume of the proposed dredged sediments with four volumes of water from the selected disposal site (or open

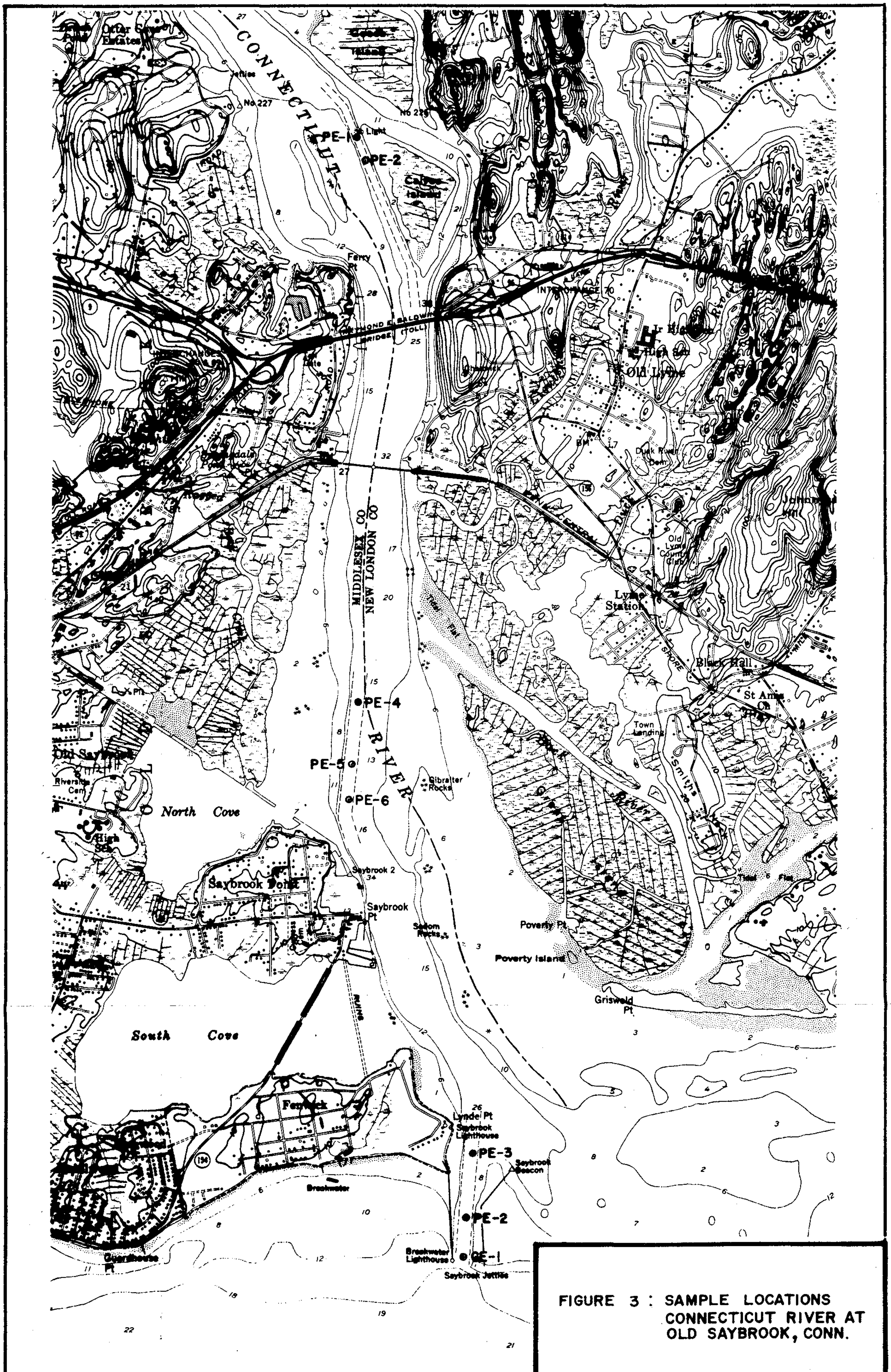


FIGURE 3 : SAMPLE LOCATIONS CONNECTICUT RIVER AT OLD SAYBROOK, CONN.

TABLE 3

SEDIMENT ANALYSIS

Parameter		Surface	SAMPLE DEPTH (FT) >0 <1.0 Range	Mean	>1.0 Range	Mean
Vol. Solids - EPA	(%)	7.9	1.9 - 7.0	4.6		
Tot KTDL - Nit.	(%)	0.2	0.02 - 0.8	0.2		
Chem. Ox. Dem	(%)	10.4	0.61 - 8.9	4.2		
Solids	(%)	43.4	34.9 - 79.1	62.1	43.8 - 82.3	59.5
Hex Sol Oil+Grse	(%)	0.2	0.03 - 0.24	0.12		
Hg	(ppm)	0.29	0.00 - 0.60	0.24	0.00 - 0.92	0.51
Pb	(ppm)	83.	30. - 180.	49.	16. - 105.	62.
Zn	(ppm)	286.	46. - 172.	118.	39. - 234	139.
As	(ppm)	2.1	0.86 - 8.4	3.0	0.75 - 3.7	2.4
Cd	(ppm)	1.9	0.99 - 4.3	2.6	1.0 - 5.2	3.1
Cr	(ppm)	65.	13. - 69.	35.	15. - 78.	45.
Cu	(ppm)	75.	13. - 103.	59.	10. - 100	48.
Ni	(ppm)	51.	20. - 71.	37.	17. - 55.	33.
V	(ppm)	4.3	31. - 80.	47.	18. - 44.	26.

ocean environment) and shake the two ingredients together for thirty minutes. The criterias for acceptability of the sediment as "unpolluted" is that the elutriate must not exceed 1.5 times the chemical analysis of the "dumping ground water." The results of the elutriate test appear in Table 5. The results are based on only two sediment samples and it should be pointed out also that the water samples were obtained from the Connecticut River ("dredge site water") and not the proposed Cornfield Shoals dump grounds located in Long Island Sound. It is indicated also that the water samples were collected at "near bottom" which would be expected to contain higher concentrations of the parameters tested than either river's surface waters or waters characterizing the disposal area in Long Island Sound. None of the parameters tested exceed the 1.5 allowable limit.

In conclusion, it has been shown that sediment from the Connecticut River at Old Saybrook contains at least normal amounts of the parameters in Table 4. Therefore no unusual quantities of pollutants are being considered for dumping.

d. Sediment Analysis of the Dump Site. Core sample data is not available for the Cornfield Point Disposal Area. As far as known, no such studies have been made. However, in a benthos survey of this area (Pratt 1976) sediment was described as silty, mixed with sand and pebbles. In Section 4a, spoil material is described as silt to sand mixed with organics. This description compares closely to that of the Cornfield Point Disposal Area therefore, physical alteration of the sediment will not occur. This ensures that swift recolonization will take place, eliminating any long term impact to the ecology of the dump site.

TABLE 4

SEDIMENT ANALYSIS COMPARISON

Parameter	Branford Hbr., Connecticut	Conn. River at Old Saybrook, Conn.	Hampton Hbr., N.H.	Cape Cod Canal, Mass.	EPA Criteria
Visual Classification					
Vol. Solids-EPA (%)	10.9	4.6	–	0.53	–
Tot KJDL Nit (%)	0.56	0.23	0.24	0.01	–
C.O.D. (%)	14.64	4.2	7.7	0.38	–
% Solids	31.02	60.9	56.6	80.6	–
Hex.Sol.Oil+Grse(%)	0.84	0.12	0.21	0.03	–
Hg (ppm)	1.0	0.37	0.10	0.15	0.75
Pb (ppm)	206.	68.	42.0	5.59	–
Zn (ppm)	672.	1544.	68.8	10.2	–
As (ppm)	12.9	2.7	7.30	–	–
Cd (ppm)	17.6	2.9	1.42	–	0.60
Cr (ppm)	749.	40.2	55.2	–	–
Cu (ppm)	832.	53.9	39.9	11.5	–
Ni (ppm)	133.	35.3	14.9	–	–
V (ppm)	113.	36.1	33.2	–	–

*All values reported are means

TABLE 5

NEW ENGLAND DIVISION, CORPS OF ENGINEERS, U. S. ARMY

REPORT OF NEW ENGLAND DIVISION, MATERIALS TESTING LABORATORY

WATER AND SEDIMENT TESTING

SAYBROOK SHOALS, INNER AND OUTER BAR, SAYBROOK CT.

MARCH 1977

1. Sample identification and field and laboratory pertinent to the samples tested are as follows:

Pertinent Data	Bottom Sediment Samples and Water from Dredge Site					
Laboratory Serial No.	100-237-3	100-237-10	100-237-4	100-237-11	100-237-8	100-237-12
Exploration No.	GE-3-77	EW-3-77	GE-4-77	EW-4-77	GE-8-77	EW-8-77
Sample No.	B-1	J_1-J_2	B-1	J_1-J_2	B-1	J_1-J_2
Sample Depth, Ft.	Surface	Near Bottom	Surface	Near Bottom	Surface	Near Bottom
Coordinate Locations:						
North	178,999	178,999	169,090	169,090	158,660	158,660
East	710,640	710,640	709,840	709,840	712,300	712,300
Sounding, Ft.						
Reduced Sounding, Ft(MLW)						
Date-Hour Sampled	7073-1230	7073-1230	7073-1250	7073-1250	7075-0952	7075-0952
Weather	91	91	91	91	91	91
Sea State	2	2	2	2	2	2
Secchi Discs						
Black	1.3	1.3	1.2	1.2	0.5	0.5
White	1.8	1.8	1.9	1.9	1.0	1.0
Visual Classification:	Tan fine sand (SP) w slight marine odor	Sea Water	Greyish tan silty fine sand (SM) w marine odor	Sea Water	Blackish tan silty fine sand (SM) w/marine odor and some algae	Sea Water

TABLE 5

NEW ENGLAND DIVISION, CORPS OF ENGINEERS, U. S. ARMY

REPORT OF NEW ENGLAND DIVISION, MATERIALS TESTING LABORATORY

WATER AND SEDIMENT TESTING

SAYBROOK SHOALS, INNER AND OUTER BAR, SAYBROOK CT.

MARCH 1977

Results of tests performed on (1) the standard elutrient resulting from the "shake test" using 1 part bottom sediment from various sampling locations with 4 parts water from each location and (2) the virgin water from each location are as follows:

Test Property (2)(3)	Standard Elutrient and Dredge site Water Designations (1)					
	GE-3-77	EW-3-77	GE-4-77	EW-4-77	GE-8-77	EW-8-77
Nitrite (N), mg/l	NOT ANALYZED	NOT ANALYZED	0.033	0.010	0.020	0.010
Nitrate (N), mg/l			<0.10	0.44	<0.10	0.26
Sulfate (SO_4), mg/l			128.2	11.5	250.0	135.0
Oil and grease, mg/l			6.5	2.4	1.8	1.6
Phosphorus (P)						
Ortho, mg/l			0.040	0.045	0.010	0.013
Total, mg/l			0.300	0.050	0.094	0.033
Mercury (Hg), ug/l			0.35	0.25	0.1	0.1
Lead (Pb), ug/l			5	<2	10	<2
Zinc (Zn), ug/l			22	18	3	10
Arsenic (As) ug/l			0	0	0	3
Cadmium (Cd), ug/l			1	0.5	2	<0.5
Chromium (Cr), ug/l			<3	<3	<3	<3
Copper (Cu), ug/l			24	27	3	20
Nickel (Ni), ug/l			10	5	5	7
Vanadium (V), ug/l			<10	<10	<10	<10

NOTES:
1. **Elutrient designations GE-3-77, etc. correspond to location of sediment sample with same Exploration number as shown on sheet 1. Designations EW-3-77, etc. correspond to location of dredge site water.**
2. **All tests performed by NED Materials Laboratory Personnel are in accordance with current accepted EPA procedures.**
3. **Reference is made to Section 230 4-1 of Federal Register dated Friday, September 5, 1975, Vol 40, No. 173, Part II (EPA), "Discharge of Dredged or Fill Materials into Navigable Waters."**

5. PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED.

Maintenance dredging will pose several unavoidable adverse environmental impacts. These will include degradation of Water Quality and disturbance and/or burial of benthic communities. As stated previously, impacts to Water Quality by sediment introduction will only be temporary. Settling will force most materials out of solution; elapsed time depending on particle size and currents. Dispersion by currents will allow dilution of remaining materials in the water to a point of unconcern. Thus, impacts from suspended sediment will be confined to a small area and for a short period of time.

It has been established that the biota in the Connecticut River are already tolerant to an environment similar to that produced by small scale maintenance dredging. Therefore, benthos, other than those in the immediate vicinity of dredging and dumping, will not be severely effected. In the areas where severe disruption and removal of benthos will take place economic justification is demonstrated. Ecological impacts should not be considered permanent. Recolonization should be rapid especially at the dump site as spoil material is physically similar to the sediment it will cover.

6. ALTERNATIVES TO THE PROPOSED ACTION

Alternatives arise in three aspects of the project. There is the option of no action, choice of dredging method, and finally the site of disposal of the dredged material (various locations on land and open water).

a. No Action. Failure to maintain the Connecticut River navigation channel will have a severe economic effect on the region being serviced by waterborne traffic. In addition, increased groundings with the possibility of oil spills will become eminent as will collisions. Alternatives will be to transport oil by various modes of transportation: railroad tank cars, pipelines and trucks. The use of railroad tank cars from the point of origin or from intermediate retailing points will require the purchase of numerous new tank cars, the acquisition of new lands, if available, and the development of sidings on the transportation route. Also, more hired help would be necessary to handle the increased workload, and intermediate delivery points would entail more storage and rehandling facilities resulting in higher costs. Many oil company storage tanks in the East Hartford area are located far from rail facilities thus, negating direct transfer. Therefore, either rehandling by truck or pipeline would be required from freight yards, or existing storage facilities would have to be relocated.

Direct delivery by truck from refineries or intermediate rehandling points would be even more costly due to the much smaller quantities which could be delivered per trip. The use of pipelines would entail initial construction of such lines to existing facilities. One problem to be encountered would be the requirement for steamjacketed pipelines to permit pumping of high viscosity residual oil during cold weather. This type of pipeline would be extremely expensive to construct. The number of pipelines would be high to separate the transportation of various types of products. Therefore, direct delivery by barge is the most economical method of transporting petroleum products to outlets on the Connecticut River.

Curtailment of shipping on the river is not feasible at the present time nor in the foreseeable future. The impact of such an action on available resources would be catastrophic, ultimately affecting many millions of people in the northeast region. To follow a no-dredging policy would economically cripple industries and the general population in the area.

In addition to the concern for shipping interests, there is a detrimental environmental impact that will occur if no action is taken. This involves the movement of vessels over the shoal material in the channels. As the barges are hauled, the action of the tugs propeller stirs up the bottom material, thus affecting the water quality repeatedly with the passage of each tug. The more shoaling that occurs, the more the opportunity for disturbing the environment. Considering the volume of commercial traffic that transits the channel, the effects are considerable. The removal of the shoal material would eliminate this problem.

b. Disposal of Dredged Material. Alternatives involving land disposal of dredged material were not considered in any detail for the Connecticut River project because of the lack of feasible land-based sites. Basically, the technical feasibility constraints on such a site are the following: (1) The maximum economic distance to which material could be pumped is 10,000 feet from the dredging site, and (2) the maximum height that the material could be lifted is 30 feet, thus the top of the fill material could be a maximum of about 23 feet above mean low water. In view of existing land used along the Connecticut River, the absence of suitable land sites is understandable. More innovative dredged material disposal techniques, such as the creation of artificial islands or marshes, do not offer practicable solutions to the disposal problem. The small quantities of material that must be dredged are not sufficient for undertaking a project of this type. Island creation is not very applicable in Connecticut due to the lack of socially and environmentally acceptable sites.

In essence, some form of open-water disposal is the only viable option for the Connecticut River project. The Corps realizes the necessity of examining all dredging activities in Long Island Sound in a comprehensive manner. A possible format and scope for such a regional assessment are currently being discussed with the Connecticut Department of Environmental Protection. A similar regional approach has been taken by the Corps of Engineers in evaluating problems of dredging in the Narragansett Bay-Block Island Sound area. At the same time, the State of Connecticut is proceeding to formulate a Sound-wide policy statement with respect to dredging and dredged material disposal. As earlier mentioned, the views of interested citizens, scientists, and groups will be solicited as inputs to the policy development process.

Both of these efforts should be directed toward resolution of conflicts, problems, and questions about dredging and disposal in the Sound. Fundamental issues include the location of regional disposal sites, what types and amounts of dredged material should be placed in specific sites, how often and when they should be used, the necessity for monitoring programs, and acceptable methods for making these determinations.

c. Dredging Methods. There are four methods of dredging to be considered in New England: Hopper dredging, Bucket and Scow, Hydraulic with pipeline, and Sidecaster. Hydraulic and Sidecaster methods can be eliminated from consideration based on operational requirements. Lack of available land disposal sites omits Hydraulic dredging as an alternative. Sidecaster dredging in only suitable in narrow channels with land disposal areas located eighty to ninety feet from the dredge. These conditions are not satisfied at the sites of proposed maintenance dredging in the Connecticut River. Thus, there remains only two feasible alternative methods of dredging: Hopper and Bucket and Scow. As discussed in the Project Description, final decision is pending on bids from bucket and scow contractors. As environmental impacts associated with either method are similar, a choice cannot be made in this respect. In addition, either method is equally suitable from an operational standpoint so that the ultimate decision will be based on cost.

7. RELATIONSHIPS BETWEEN SHORT-TERM AND LONG-TERM GAINS AND LOSSES.

Short-term losses of biota in aquatic ecosystems, as well as long-term utilization of water resources will result from the proposed project.

Short-term disruptions and losses of life have been discussed in this report. Living systems can establish new dynamic equilibria and resume productivity after disruptions by natural or man-made events. It is improbable that the actions proposed in this project will cause long-term disruptions in aquatic productivity.

A long-term gain from the proposed project is maintenance of recreational and cultural resources. Periodic but infrequent maintenance dredging of recreational anchorages and channels will be required as long as boating usage remains at the present level. This is not expected to affect any long-term disruption because of major land use changes. The area is recognized as one of cultural, historical, and recreational importance, and it is likely that these resources will be preserved.

Navigational maintenance to the 15' channel in the Connecticut River is necessary to insure the safe and unobstructed passage of oil barges. This oil supplies the energy needs of industry and homeowners alike and is essential to the socio-economic stability of the area. Because of the relatively small size of the project and scheduling of the maintenance operation, serious effects to the indigenous river biota or to migrating species such as the shad are not expected. The assumption made is that the economic benefits resulting from the channel maintenance outweigh any possible adverse effects. Maintenance of navigation in the river is thus viewed as a long-term gain in economic productivity.

8. <u>IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENTS OF RESOURCES</u>.

The labor and capital necessary to maintain the authorized dimensions of the Connecticut River channel represent irretrievable resource commitments. Although losses of some benthic organisms during dredging and open water disposal are irretrievable, the effects on the ecosystems are not irreversible, recolonization of disturbed areas is known to begin shortly after cessation of the disturbance. Effects on the ecology of the open water disposal site probably represent the longest lasting impacts discussed in this assessment.

9. REFERENCES

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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
New England Field Office
P. O. Box 1518
55 Pleasant Street
Concord, NH 03301

Davison
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February 16, 1977

Division Engineer
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Sir:

This is our report on your proposed maintenance dredging in the Connecticut River at Old Saybrook and Old Lyme, Connecticut. It is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We understand that about 70,000 cubic yards of material will be dredged from Saybrook Outer Bar, Saybrook Shoal, and Calves Island Bar. The material from the Saybrook bars is silt and silty sand, while at Calves Island Bar, the material is fine to medium sand. The dredged material will be removed by a Corps of Engineers hopper dredge and deposited in the Cornfield Shoal Dumping Ground extension. There is a possibility that a private contractor utilizing a bucket dredge and dumping scows will be selected to perform the maintenance dredging operations.

The scheduling of dredging for July will not interfere with movements of American shad or Atlantic salmon, even should the dredging not occur until August. However, use of a hopper dredge in the Saybrook bars will result in high levels of turbidity throughout the period of dredging, which may have adverse effects on other forms of aquatic life, particularly juveniles, during this time of year. Use of the hopper dredge at Calves Island Bar would cause less of a turbidity problem, if indeed the material is sand. Therefore, we would recommend that a bucket or clamshell dredge be used for the work in the Saybrook Outer Bar and Saybrook Shoal, if at all possible. Should future surveys reveal the presence of major amounts of silts and clays at Calves Island Bar, we would appreciate being informed for possible further comment.

In terms of the disposal site, we have no objections to its use, provided physical and biological monitoring is performed on an on-going basis at the site.

Sincerely yours,

Melvin R. Evans

Melvin R. Evans
Field Supervisor, NEFO

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Federal Building, 14 Elm Street
Gloucester, Massachusetts 01930

February 23, 1977

Col. John P. Chandler
Division Engineer
Department of the Army
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler:

The National Marine Fisheries Service has reviewed the information which accompanied Mr. Andreliunas' letter dated January 19, 1977, regarding use of hopper dredges for maintenance dredging activities at the Cape Cod Canal; Newburyport Harbor, Massachusetts; and the lower reaches of the Connecticut River around Saybrook, Connecticut. Our comments on the Cape Cod Canal and Newburyport Harbor were sent to you on February 2, 1977; this letter addresses our concerns with the Connecticut River project.

Use of a rapid cycling, on-site dewatering hydraulic hopper dredge to handle silt and fine grained materials would create high levels of turbidity in the water column. Because these grain sizes are present at the Saybrook Outer Bar Channel and Saybrook Shoal Channel we have reservations about approving such work. As for the upper shoal (Calves Island Channel), while preliminary data indicates it is sand, we believe that the sediments may in fact be lensed with grain sizes varying down to include silt fractions. Indications are that organics are present at all sites.

The tentative schedule of implementation for this proposal compounds our concern. The July period is one of major reproductive activity for oysters and clams. High and/or persistent levels of turbidity and abnormal siltation beyond the already heavy loads found in the Connecticut River may create stresses in the community structure which will decrease the standing crop in these reaches.

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In order to minimize or alleviate these threats we recommend that only dipper or clamshell dredging be utilized at the two Saybrook sites and, if possible, the Calves Island location. Use of the hopper dredge at the latter site may also be unacceptable if core probing data reveals the presence of appreciable volumes of silt sized fractions. To insure against such a circumstance we would appreciate receiving any substrate data your offices have generated as a result of surveys at the Calves Island Channel.

Sincerely, Marvin F. Bowen

for

William G. Gordon
Regional Director